



**THE URBAN OPERATIONS LABORATORY**

# **Advancing Military Systems Toward Sustainability Through Innovative Environmental Assessment**

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**Monday, May 4, 2009**

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### Overview

- Background
- Environmental Assessment Methods and Approaches
- UOL Project Examples
- Looking to the Future – Other Initiatives
- Other Partners
- Conclusions

## What is the UOL?

- One Program – Urban Operations Laboratory
  - Effective public-private partnership
  - M2 Technologies
  - CABEM Technologies
  - Kansas State University
  
- Seven Tasks
  - Bomb Detection and Countermeasures
  - Operations Environmental Laboratory
  - Robotics and Sensors, Nanotechnologies
  - Human Factors
  - Strategic Planning, Integrated Facility Support



## UOL Task – Operations Environmental Laboratory

- Nonlethal Environmental Evaluation and Remediation Center (NEER)
  - Environmental Assessments (EA) team
  - Performs life-cycle environmental evaluations and remediation analyses activities
- Environmental Knowledge and Assessment Tool (EKAT)
  - Web-based environmental decision tree software
    - PESHEs, NEPA evaluations, LCEAs
  - Initial funding agency was USMC, Quantico, VA
  - Program adopted and modified for use by National Center for Medical Intelligence (NCMI)

## The Drivers

### ■ Existing ESOH Requirements

- Int'l, Fed, State, Local, Military, etc. (Multimedia regs, NEPA, EMS, etc)
- Systems Engineering (DoDD 5000.01, DoDI 5000.02, MIL-STD-882D, etc)
- EO 13423 Strengthening Federal Environmental, Energy, and Transportation Management
- ISO 14000 series (env mgmt, LCA, impacts, GHGs, etc)
- Green ammo initiatives

### ■ Looking Forward

- Sustainability frameworks for bootprints
- Green Chemistry and Engineering
- Cradle-to-Cradle

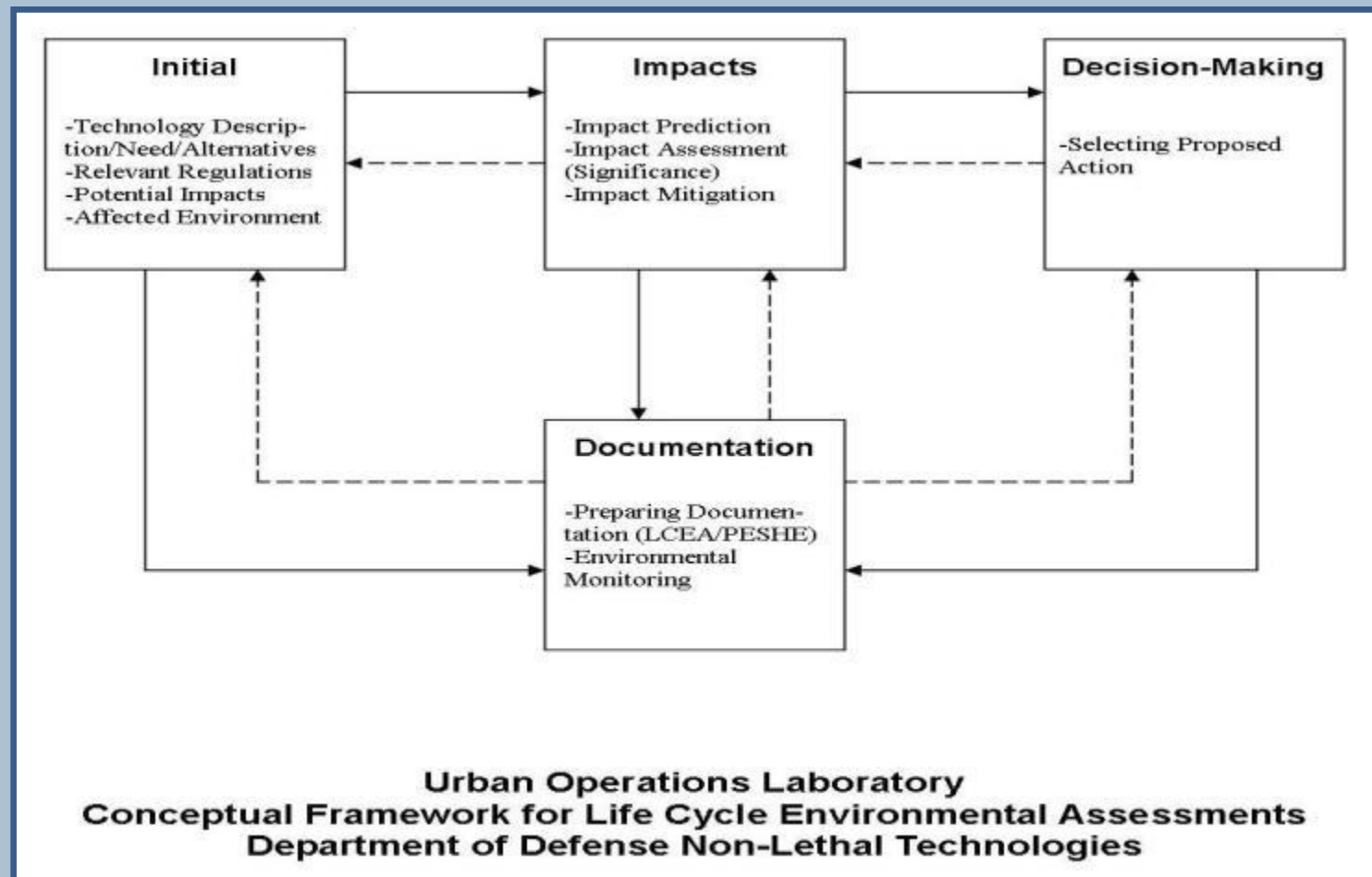


## Military and the Environment – a Complex Marriage

- A Long History
  - Lewis and Clark Expedition, 1804 (Natural & Cultural Resources)
  - Progress from control to prevention to sustainability
  - Focus areas: conservation, restoration, compliance, pollution prevention
- Military Munitions Legacy
  - 15 M acres, ~ 2300 sites (GAO, 03)
  - Colorado (34 sites)
  - \$8-35 Billion and 75 years to clean up
- Need for Better Tools & Methods
  - EKAT/Innovative EA



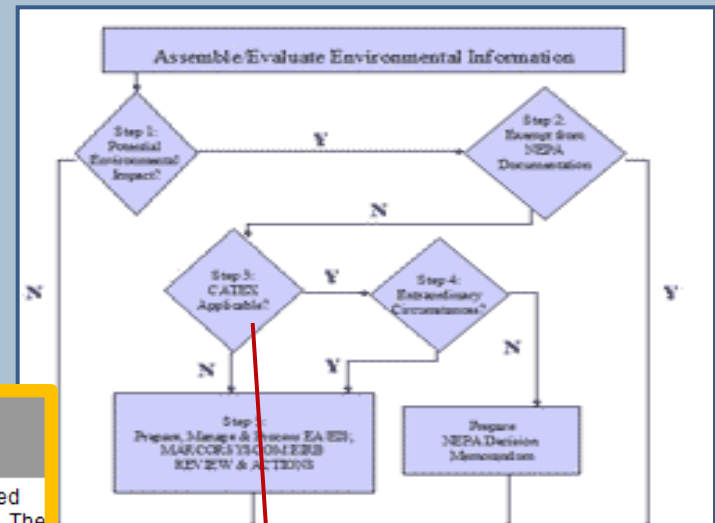
## UOL Life Cycle Framework – Proactive and Iterative





## Life Cycle Framework – Proactive and Iterative (cont'd)

- Initial Characteristics
  - Description/rationale
  - EKAT screenings and NEPA tools
  - Baseline



**Enter a Chemical**

Enter a chemical name or a CAS Number. Use the mouse to click on 'next'. Exact spelling, use the mouse to select 'Go'.

CAS Number

Chemical

**CLEAR ENTRY**

**PREVIOUS** **NEXT**

Chemical	Category	Results
benzene	CWA	benzene (71-43-2) - a hazardous substance listed under Section 311 of the Clean Water Act (CWA). The reportable quantity (RQ) is 10 pounds (4.54 kg). [ref: 40CFR117]
	NIOSH	benzene (71-43-2) - has a recommended exposure limit (REL) for worker exposure to this material in a confined space. The REL is Ca TWA 0.1 ppm ST 1 ppm See Appendix A.  The concentration in air that NIOSH states is immediately dangerous to life and health (IDLH) is 500 ppm.  benzene (71-43-2) belongs to the group of chemicals, Coal Tar Pitches and Coal Tar Pitch



**E-KAT**

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**STEP 1: PESHE Report Generator Tool: Instructions**

The PESHE Report Generator assists the user in completing a PESHE report by providing a template, guidance, links to other resources, and E-KAT tools to evaluate environmental regulations and health and safety risks. Results from E-KAT assessments may be automatically input into the PESHE report for a project. Reports may be stored within E-KAT, electronically shared, and/or printed as Word documents for further editing.

**More Information**

**E-KAT Instant Help**

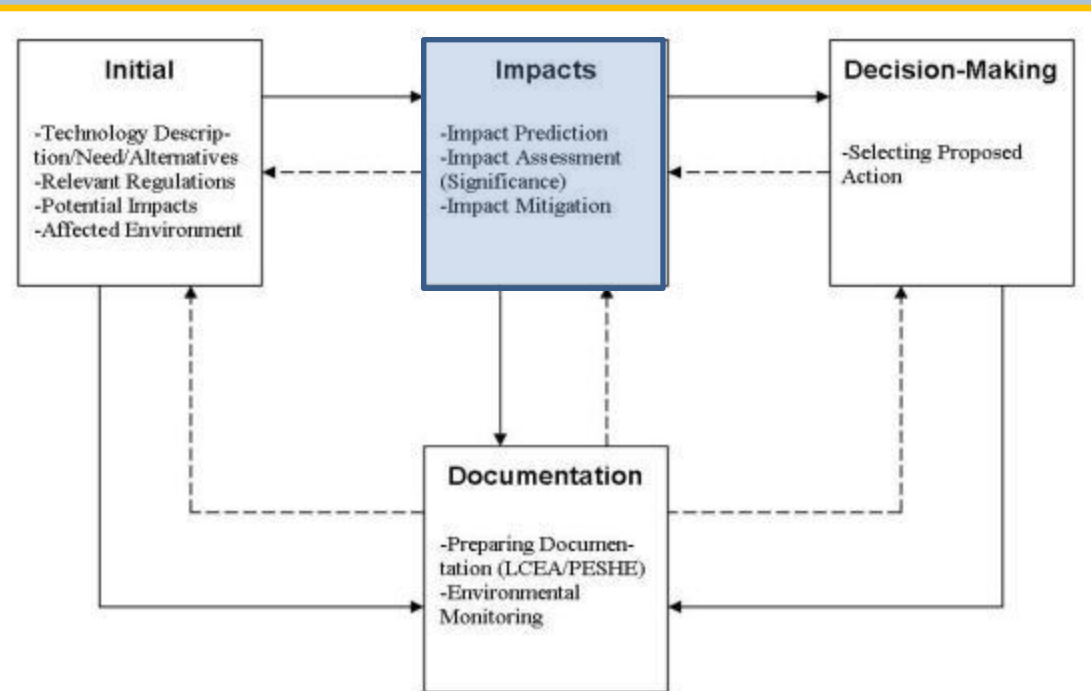
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## Life Cycle Framework – Proactive and Iterative (cont'd)

- Evaluating Impacts
  - Multidisciplinary and flexible teams of SMEs
  - Models, sampling
  - Predictive and empirical



Urban Operations Laboratory  
 Conceptual Framework for Life Cycle Environmental Assessments  
 Department of Defense Non-Lethal Technologies

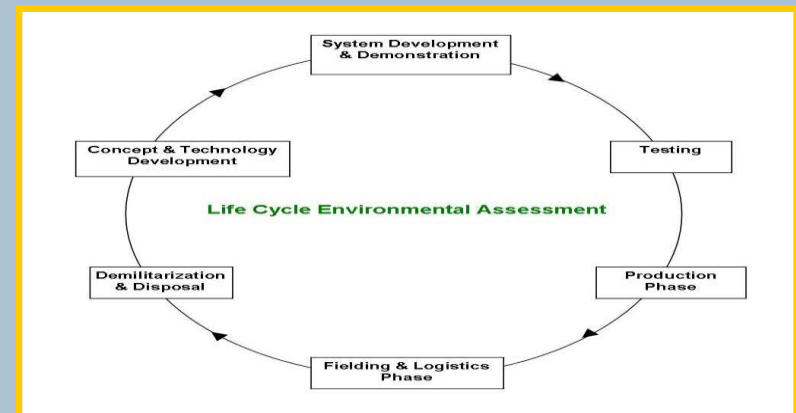
## Life Cycle Framework – Proactive and Iterative (cont'd)

- Decision Making
  - IPT, PM, leadership
  - User feedback loops
- Documentation
  - Strategic-level
  - Operations-level
  - Site-specific  
(public stakeholders)

ESOH Category	COLOR CODED RATINGS & NUMERIC VALUE		
	GREEN (1.0)	YELLOW (2.0)	RED (4.0)
PLANNING (0.25)	0.25		
HAZARDS (0.1)		0.2	
REQUIREMENTS (0.4)	0.4		
FUNDING (0.25)		0.50	
<b>SUM TOTAL (1.35)</b>			
Roll-Up Rating (Color) Status		Roll-Up Rating (Numeric) Score Range	
GREEN		(1.00 – 1.30)	
YELLOW		(1.31 – 2.00)	
RED		(2.01 +)	

## Technology Acquisition – Assessment Opportunities

- Materiel Solution Analysis
  - Planning & AoA
- Technology Development
  - COTS, design, and prototype T&E
- Engineering & Manufacturing Development
  - Integrated systems
  - Manufacturing processes



- Production & Deployment
  - Deploy, transport, storage
- Operations & Support
  - Life-cycle sustainment
  - Demilitarization & disposal

## Military Systems – Nonlethal Applications

- Emerging Systems Evaluated or Under Evaluation
  - Mobility Denial System/Anti-Traction Material
  - Improved Flash-Bang Grenade
  - Joint Nonlethal Warning Muniton
  - Odorants and Aromatics
  - Mission Payload Module – Nonlethal Weapon System
  - Nonlethal Airburst Munitions
  - Nonlethal Thermobaric Technology
  - Pulsed Energy Projectile
  - Running Gear Entanglement system
  - Luminescent Gel Capsules
  - Bomb Detection and Countermeasures



## Mobility Denial System/Anti-Traction Material (Marines)

### ■ Initial Characteristics

- Slippery hydro-gel sprayed on surfaces
- Identified benzene and acrylamide in initial design
- GIS site suitability tool

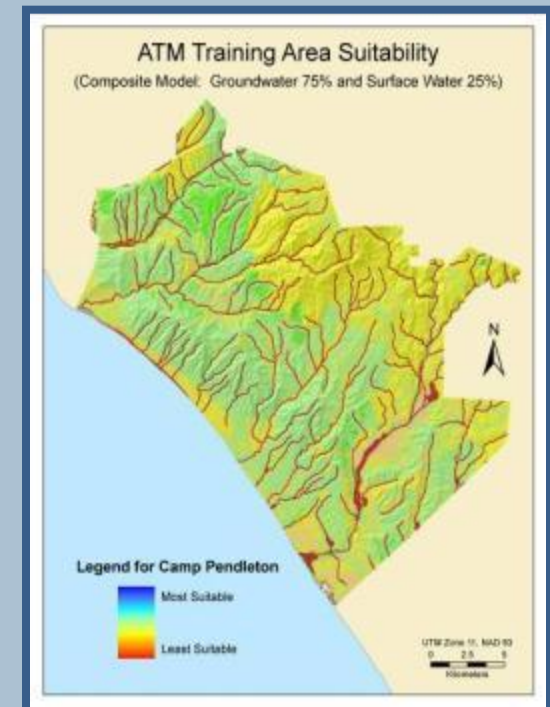
### ■ Evaluating Impacts

- Sampling and analysis
- Risk assessment
- Optimized formulation (removed benzene, minimized acrylamide)
- PPI (two-tie dusk masks, goggles, moisture resistant clothing)
- BMP (cleanup, avoid water resources, tech manual)



## Mobility Denial System/Anti-Traction Materials (cont'd)

- Decision Making
  - Evaluated site-specific NEPA (29 Palms, CA)
  - NEPA Decision-Memorandum
  - Programmatic FONSI
  
- Documentation
  - Life cycle environmental assessment
  - Technical Manuals
  - PESHE

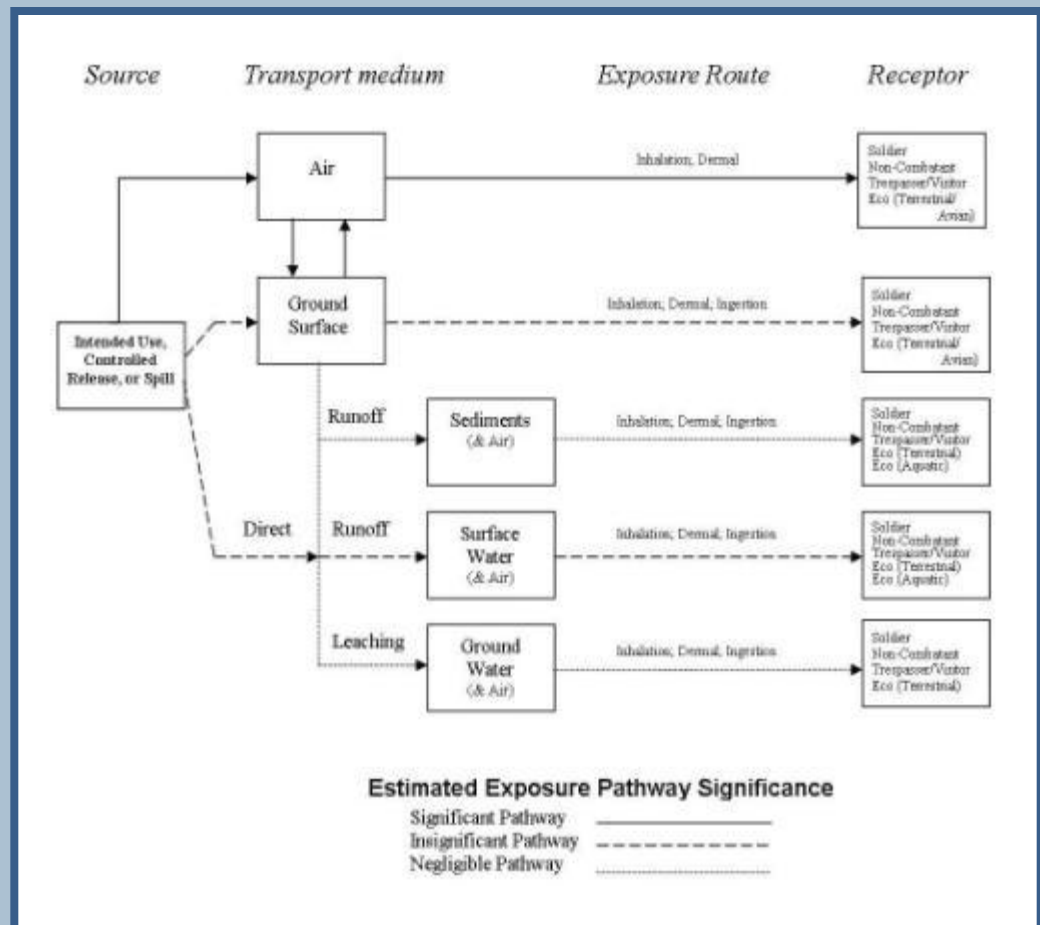


## Odorants and Aromatics (Army)

- Initial Characteristics
  - Foul smelling payload delivered via nonlethal munitions
  - Identified thiophenol (highly toxic) in early formulation
- Evaluating Impacts
  - Toxicity assessment and predictive modeling
  - Down-selected formulation (removed thiophenol)
  - Calculated release scenario impacts (dispersal)
  - Recommended ecotoxicity testing
  - PPE for certain phases
  - BMP (controlled release)

## Odorants and Aromatics (cont'd)

- Decision-Making
  - Conditional Programmatic FONSI
- Documentation
  - LCEA



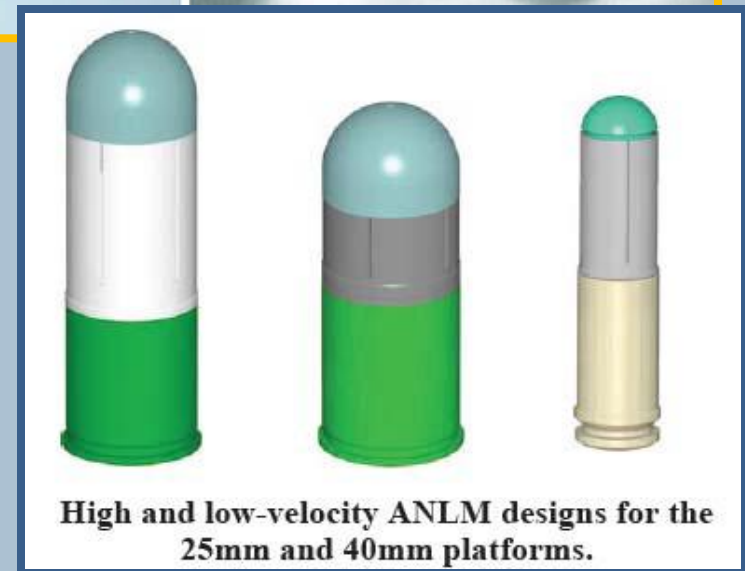
## Nonlethal Airburst Munitions (Army)

- Initial Characteristics
  - Various launch platforms and payloads considered (rubber balls, pyrotechnics, flash-bang, etc.) for small arms longer range
  - Identified tungsten ballast in initial design
- Evaluating Impacts
  - Literature review of tungsten compounds and particle size impacts
  - Down-selected payload and platform (eliminated tungsten)
  - Evaluated conventional and novel components
  - Limited field sampling
  - Integrated prototype being finalized
  - Additional environmental data collection planned



## Nonlethal Airburst Munitions (cont'd)

- Decision-Making
  - Programmatic FONSI
- Documentation
  - LCEA
  - PESHE
  - Chamber & field test data reports



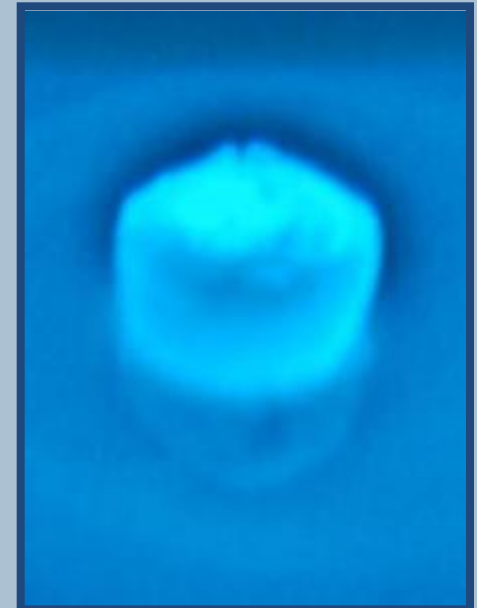
## Mission Payload Module - Nonlethal Weapon System

- Initial Characteristics
  - SEP, TEMP, THEEP
- Evaluating Impacts
  - IPT, SBT, Contracting
- Decision-Making
  - HERB, MDA
- Documentation
  - PESHE, LCEA, IHAR



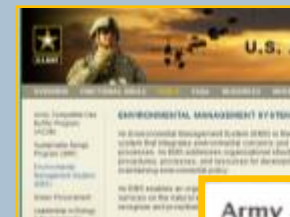
## Luminescent Gel Capsules (UOL)

- Initial Characteristics
  - Area surveillance marking and monitoring technology
  - Emission of visible light or thermal signal (infrared)
  - Identifying materials and properties
  - Core reactions, shell, and oxidation products
- Evaluating Impacts
  - EKAT screening
  - Toxicity assessments and predictive modeling
- Decision-Making & Documentation
  - LCEA underway

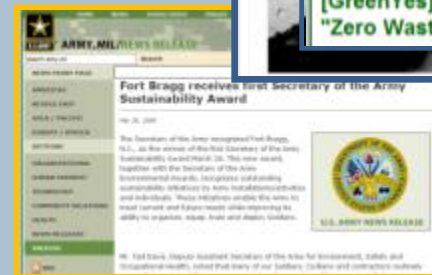


## Other Initiatives and DoD Efforts

- DoD and Other Sustainable Development Initiatives
  - Insensitive Munitions
  - Design for Demilitarization
  - Product Stewardship
  - Cradle to Cradle
  - Zero Waste
  - Substance Flow Analysis
  - Military Sustainability



**[GreenYes] [OFEE] 2006 White House Award Winners includes KY Army Fort with "Zero Waste is the Goal"**



chlorofluorocarbons. The most predominate of those emissions are carbon dioxide and then methane, said Tad Davis, the deputy undersecretary of the Army for environment, safety, and occupational health.

The greenhouse gas proof-of-concept study was conducted at Fort Carson, Colo.; Fort Benning, Ga.; Letterkenny Army Depot, Pa.; Fort Indiantown Gap, Pa.; Aberdeen Proving Ground, Md.; Redstone Arsenal, Ala.; Fort



## Other Stakeholders

- Consortium for Environmental Stewardship and Sustainability (CESAS)
  - A network of partner organizations working collaboratively to advance sustainability and sustainable development
- National Institute for Land Management and Training
  - Provides nationwide technical support for the U.S. Army Integrated Training Area Management (ITAM) program and related activities



## Improving Systems and Processes

### ■ Lessons

- Early upstream involvement key (teams and tools)
- Joint planning and testing
- E and SOH integration
- Balance ESOH aspects with product performance
- Relationships and network beyond project



## Improving Systems and Processes (cont'd)

- Benefits
  - Risk and liability reduction
  - Regulatory cost, time, and pollution prevention savings
  - Product and service innovation
  - Triple bottom line effectiveness (people-planet-prosperity)
- Challenges
  - Transcend stovepipe barriers
  - Leadership commitment (PMs as champions)

## Acknowledgments

- Marines Expeditionary Rifle Squad (MERS),  
USMC Systems Command
- Joint Non-Lethal Weapons Directorate  
(and other U.S. DoD Services)
- M2 Technologies, Inc.
- CABEM Technologies, Inc.
- CESAS Network
- Kansas State University faculty and graduate students

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